

REMARKS/ARGUMENTS

Claims 1-3, 5-12, and 14-20 are pending in the application. Claims 1, 2, 8, 9, 11, and 12 have been amended. Support for the amendments can be found in the specification, for example, on pages 5 and 7, as well as in the original claims. No new matter has been added by way of amendment. Re-examination and reconsideration of the claims as amended are requested.

Applicants note that no statements have been made in the Office Actions that the drawings as submitted are not acceptable. Applicants request clarification if the drawings are in fact not acceptable so that appropriate action can be taken to correct any problems.

The Objection to the Specification Should Be Withdrawn

Applicants note that the specification was amended in Applicants' previous response of 8/14/03 as suggested in the previously-issued Office Action of 6/17/03. However, the outstanding Office Action of 4/8/04 reiterates the objection to the specification verbatim from the previously-issued Office Action of 6/17/03. Applicants are confused by this duplicate objection, but it seems that these amendments have not been entered in the case and so Applicants are resubmitting the amendments here. If the objection is now made on a different basis, clarification is requested so that Applicants can properly address the objection.

The Rejection of Claims Under 35 U.S.C. §112, First Paragraph, Should Be Withdrawn

The Office Action (4/8/04, pages 2-3) has rejected claims 1-3, 5-12, and 14-20 under 35 U.S.C. §112, first paragraph, as failing to comply with the written description and enablement requirements. Applicants respectfully traverse these rejections.

Particularly, the Office Action (page 2) stated that a limitation that had been added to independent claims 1 and 8 constituted new matter and therefore the claims failed to comply with the written description requirement. This limitation recited that the engineered protein comprised an amino acid sequence which differed from the amino acid sequence of a native protein by at least one essential amino acid residue. While the specification does not provide *in haec verba* support for this limitation, Applicants believe that the description of the invention in the specification encompasses such embodiments. For example, on page 5 (lines 1-5) generally

discuss the types of modifications that can be made to a protein, and on page 14 (lines 16-17), the specification discusses that "theoretically each variant contains zero to twenty-two additional methionines." Applicants note that "[i]n order to satisfy the written description requirement, the disclosure as originally filed does not have to provide *in haec verba* support for the claimed subject matter at issue." *Purdue Pharma L.P. v. Faulding, Inc.*, 230 F.3d 1320, 1323 (Fed. Cir. 2000). Nevertheless, in order to advance prosecution, this limitation has been removed from the claims. Accordingly, the written description rejection on this basis should be withdrawn.

The Office Action (pp. 3-4) has maintained the rejection of claims 1-3, 5-12, and 14-20 as failing to comply with the written description requirement. The Office Action states that:

Applicant does not describe a representative number of exemplary nucleic acid molecules that define the genus of sequence[s] having increased essential amino acid content as broadly claimed. There is [*sic*—are] insufficient relevant identifying characteristics to allow one of skill [*sic*—skill] in the art to predictably determine the structure of other nucleic acid molecules absent further guidance.

Applicants respectfully disagree with this conclusion. The present specification discloses the amino acid sequences of VSP α and VSP β , the sequences of several methionine-enriched VSP β variants, and a nucleic acid molecule encoding an engineered protein (VSP β -Met 10; see Figure 4). As the previous Office Action acknowledged (6/17/03, page 4):

Applicant teaches proposed methionine enriched VSP β variants based on conserved amino acid residues within VSP homologues (pages 15-16 and Figure 2); positions of possible tolerated amino acid substitutions within VSP β (pages 16-19); a strategy for isolating correctly folded methionine enriched variants of VSP β by testing for binding to a VSP β specific antibody (pages 19-22) and methionine enriched variant VSP β -[Met]10 binding to wild type VSP β specific antibodies (page 19).

Thus, the present specification provides exemplary nucleotide and amino acid sequences as well as guidance regarding evaluation of the functional limitations of the claims.

Amended independent claim 1 and its dependent claims recite that the nucleic acid molecule comprises a nucleotide sequence which encodes an engineered protein comprising an amino acid sequence which differs from the amino acid sequence of a native protein, wherein said engineered protein has an altered amino acid composition in comparison to said native

protein, wherein said altered amino acid composition comprises an increase in essential amino acid content to at least 5% and wherein said engineered protein binds to at least one antibody, monoclonal antibody, antibody fragment, or protein which binds to said native protein, wherein said native protein is VSP α or VSP β .

Amended independent claim 8 and its dependent claims recite that the stably transformed plant has inserted into its genome a nucleotide sequence which encodes an engineered protein comprising an amino acid sequence which differs from the amino acid sequence of a native protein, wherein said engineered protein has an altered amino acid composition in comparison to said native protein, wherein said altered amino acid composition comprises an increase in essential amino acid content to at least 5% and wherein said engineered protein binds to at least one antibody, monoclonal antibody, antibody fragment, or protein which binds to said native protein, wherein said native protein is VSP α or VSP β .

The Office Action (page 3) concludes that there are insufficient relevant identifying characteristics to allow one of skill in the art to predictably determine the structure of other nucleic acid molecules absent further guidance. Applicants respectfully disagree. Applicants note that the description of a representative number of species does not require the description to be of such specificity that it would provide individual support for each species that the genus embraces. *See*, Guidelines for Examination of Patent Applications Under the 35 U.S.C. 112, First Paragraph, "Written Description" Requirement, 66 Fed. Reg. 1099, 1106 (2001). Satisfactory disclosure of a "representative number" depends on whether one of skill in the art would recognize that the applicant was in possession of the necessary common attributes or features of the elements possessed by the members of the genus in view of the species disclosed. 66 Fed. Reg. 1099, 1106 (2001). Applicants respectfully emphasize that the knowledge and level of skill in the art would allow a person of ordinary skill to envision the claimed invention.

Furthermore, the description of a claimed genus can be by structure, formula, chemical name, or physical properties. *See, Ex parte Maizel*, 27 USPQ2d 1662, 1669 (B.P.A.I. 1992), citing *Amgen v. Chugai*, 927 F.2d 1200, 1206 (Fed. Cir. 1991). A genus of nucleotide sequences such as those recited in independent claims 1 and 8 may therefore be described by means of a recitation of structural features common to the genus, which features constitute a substantial portion of the genus. *See, Regents of the University of California v. Eli Lilly & Co.*, 119 F.3d

1559, 1569 (Fed. Cir. 1997); *see also* 66 Fed. Reg. 1099, 1106 (2001). The recitations that the native protein is VSP α or VSP β and that the engineered protein binds to at least one antibody, monoclonal antibody, antibody fragment, or protein which binds to said native protein is sufficient to satisfy the written description requirement.

Consequently, contrary to the conclusion stated in the Office Action, the nucleotide sequences encompassed by genus claims 1 and 8 are defined by relevant identifying physical and chemical properties. In fact, the common attributes or features of the elements possessed by the members of these genera is that they encode an engineered protein which comprises an amino acid sequence that is defined in reference to VSP α or VSP β . The necessary common features of the claimed genus are clear.

Applicants further note that the Federal Circuit has explicitly stated that

Eli Lilly did not hold that all functional descriptions of genetic material necessarily fail as a matter of law to meet the written description requirement; rather, the requirement may be satisfied if in the knowledge of the art the disclosed function is sufficiently correlated to a particular, known structure.

Amgen, Inc. v. Hoechst Marion Roussel, Inc., 314 F.3d 1313, 1332 (Fed. Cir. 2003). *See also, Moba, B.V. v. Diamond Automation, Inc.*, 325 F.3d 1306, 1320 (noting that “[i]n more recent cases, however, this court has distinguished *Lilly*” and further noting that in *Enzo Biochem, Inc. v. Gen-Probe, Inc.*, 323 F.3d 956 (Fed. Cir. 2002), “neither the specification nor the deposited biological material recited the precise ‘structure, formula, chemical name, or physical properties’ required by *Lilly*.”)

In summary, the description of a representative number of species *does not* require the description to be of such specificity that it would provide individual support for each species that the genus embraces. Applicants submit that the relevant identifying physical and chemical properties of the disclosed genus would be clearly recognized by one of skill in the art and consequently, Applicants were in possession of the necessary common attributes or features of the elements possessed by the members of the genus. Accordingly, the rejection of claims 1-3, 5-12, and 14-20 under 35 U.S.C. §112, first paragraph, for lack of written description should be withdrawn.

The Office Action (page 3) has maintained the rejection of claims 1-3, 5-12, and 14-20 as failing to comply with the enablement requirement. Applicants respectfully traverse this rejection.

The present specification discloses the amino acid sequences of VSP α and VSP β , the sequences of several methionine-enriched VSP β variants, and a nucleic acid molecule encoding an engineered protein (VSP β -Met 10; see Figure 4). As noted in the previous Office Action (6/17/03, page 4):

Applicant teaches proposed methionine enriched VSP β variants based on conserved amino acid residues within VSP homologues (pages 15-16 and Figure 2); positions of possible tolerated amino acid substitutions within VSP β (pages 16-19); a strategy for isolating correctly folded methionine enriched variants of VSP β by testing for binding to a VSP β specific antibody (pages 19-22) and methionine enriched variant VSP β -[Met]10 binding to wild type VSP β specific antibodies (page 19).

Thus, the present specification provides exemplary nucleotide and amino acid sequences as well as guidance regarding evaluation of the functional limitations of the claims. Applicants believe that the teachings of the present specification, when considered by those of skill in the art, satisfy the enablement requirement.

The Office Action (page 4) makes a number of statements regarding the enablement rejection, as follows; statements are numbered for ease of reference in the comments that follow. The Office Action states that:

[1] Applicant teaches methionine enriched variant VSP β -[Met]10 binding to wild type VSP β specific antibodies (page 19) which only suggest that VSP β -[M]et10 may be correctly folded in an E. coli secretion system as stated by Applicant in the specification on page 20, lines 1-2. This does not meet [the] required level of certainty as recited in the limitation of Claims 1 and 8 "retains the conformation of the native protein and therefore binds." [2] Further, Applicant has not addressed the Examiner's statements in the enablement rejection directed towards the limitations of monoclonal antibodies in discriminating against non-native or non-corresponding VSP β variants. [3] Moreover, the results Applicant recites on page 19 of the specification do not indicate any background binding as relative control. [4] Furthermore, no guidance is provided for making an engineered protein having an altered amino acid composition that would bind to a modified protein that binds to a native protein. It is uncertain which alteration would be compatible with the other alterations and how one would assay for productive binding. [5] Nonetheless, undue

experimentation would be required to make, clone, and express a multitude of non-exemplified variants of a nucleic acid molecule encoding a protein engineered for an increase in the level of essential amino acids, that binds with an antibody or protein molecule that also binds with a native form of the engineered protein and would require one of skill in the art to test in a myriad of non-exemplified plants for expression.

These statements, considered collectively, indicate that the Examiner is applying an inappropriately high standard of enablement to the present claims. Applicants respectfully submit that the present claims meet the enablement requirement and should be allowed.

With regard to statement 1, claims 1 and 8 have been amended to remove the limitation requiring that the engineered protein retains the conformation of the native protein. It is expected that the engineered proteins of the claims will retain the conformation of the native protein as determined by their ability to bind to at least one antibody, monoclonal antibody, antibody fragment, or protein. Indeed, the Office Action acknowledged that the working example provided on page 19 of the specification, which teaches that the exemplary engineered protein VSP β -Met10 binds to wild type VSP β antibodies, suggests that VSP β -Met10 is correctly folded in an *E. coli* secretion system. Nevertheless, in order to advance prosecution, the claims have been amended and therefore the rejection of claims on the basis that this limitation imposed a requirement for additional information has been obviated.

With regard to statement 2, the Office Action is apparently referring to the comments in the previous Office Action (6/17/03, page 5, first paragraph) stating that

Interacting molecules do not predictably interact with proteins. Bendayan *S. et al.* teach a Mab raised against one antigen cross-reacting with determinants from other proteins [citation omitted]. Further, it is well known in the art that Mab recognize linear portions of a protein of up to 8 contiguous amino acids and thus, would not necessarily discriminate against non-native or non-corresponding VSP β variants.

Those of skill in the art are aware of such phenomena and would be able to make and test antibodies for particular experiments that suited the needs of those experiments. One of skill in the art would also be able to make and use a panel of antibodies that distinguished between native proteins and proteins that had a different conformation than the native protein if the situation required such an evaluation. However, these are not requirements of the claims. The Examiner appears to be reading additional limitations into the claims and then rejecting those

“phantom claims” for lack of enablement, which is not the appropriate analysis. The present claims meet the enablement requirement and should be allowed.

Similarly, the Office Action in statement 3 indicates that the Examiner wishes that rather than simply describing the results of the experiments provided in the working examples, Applicants had provided detailed raw data from those experiments. Applicants are unaware of any requirement that raw data be provided in an application. Moreover, those of skill in the art are accustomed to descriptions of experiments that summarize the results, *e.g.*, at scientific meetings, and, without more, would not have reason to doubt results reported in this manner. If the Examiner has reason to doubt Applicants’ description of the experiments in the specification as filed, he is invited to provide an affidavit under 37 C.F.R. §104(d)(2) explaining the basis therefor so that Applicants may understand and properly address the rejection.

With regard to statement 4, Applicants note that independent claims 1 and 8 (and therefore the remaining claims, which are dependent thereon) have been amended to remove the objected-to term, “modified protein.” This term is defined in the specification, but the term “protein” which remains in the claims encompasses all types of proteins, whether modified or unmodified. Accordingly, the rejection on this basis, if any, should be removed. In this context, Applicants note the working example described on page 21, which teaches a filter lift assay involving the binding of a native protein to various engineered VSP β s:

Fifty *E. coli* colonies containing randomly mutated VSP β genes were picked as small patches to an SB agar plate containing glucose and ampicillin. Patches were allowed to grow overnight at 37°C and were then transferred to a nitrocellulose filter. On the surface of an SB agar plate containing ampicillin and IPTG, this filter was placed on top (cell-side up) of a separate blocked filter to which the antigen (*e.g.*, VSP α) had been coated. During an overnight incubation at 30°C, the cells expressed the VSP β variant they encoded. These proteins were able to diffuse through the top filter and, if correctly folded, bind the antigen-coated filter below. The next day, the antigen-coated filter was washed with PBS-0.05% Tween and incubated with HRP/anti-e tag conjugate. Since the VSP β mutants are cloned into the pCANTAB-5E vector which fuses a C-terminal epitope tag (e-tag) to the VSP β protein variants, bound proteins were detected by this antibody in combination with enhanced chemiluminescence detection.

Thus, working examples are provided in the specification illustrating the use of protein-protein interactions.

In statement 5, the Examiner concludes that undue experimentation would be required to “make, clone, and express a multitude of non-exemplified variants of a nucleic acid molecule encoding a protein engineered for an increase in the level of essential amino acids, that binds with an antibody or protein molecule that also binds with a native form of the engineered protein and would require one of skill in the art to test in a myriad of non-exemplified plants for expression.” Applicants respectfully disagree with this conclusion.

First, in contrast to the conclusions stated in the Office Action, guidance is provided as to the limitations of the claims. Applicants have provided exemplary sequences of VSP α and VSP β , as well as exemplary sequences of “VSP β -Met10,” “VSP β -Met20,” and “VSP β -Met30” (see, *e.g.*, the sequence listing). Applicants have provided extensive guidance for making proteins having altered amino acid compositions, for example, on pages 5-7 (guidance for making substitutions and discussing changes in essential amino acid content) and in the Experimental section on pages 13 *et seq.* Particularly, pages 13 and 16-17 include an extensive discussion of various protein modification strategies and describe positions expected to tolerate conservative and non-conservative substitutions; see also the data provided in Tables 1 and 2 on pages 22 and 23. The specification also provides a working example (on p. 19) in which VSP β -Met10 was produced in *E. coli* and found to bind to the same antibodies as wild-type VSP β . This example also provides guidance for using antibodies to bind to a native or engineered protein, and further guidance is provided for protein-protein interactions in the working example described on page 14. Applicants believe that this amount of guidance is sufficient for one of skill in the art to make and use the claimed invention.

Applicants stress that when evaluating the quantity of experimentation required, the court looks to the amount of experimentation required to practice a single embodiment of the invention rather than the amount required to practice every embodiment of the invention. For example, in *Wands*, the claims at issue were drawn to immunoassay methods using any monoclonal antibody having a binding affinity for HbsAg of at least 10^{-9} M. The PTO had taken the position that the claim was not enabled, as it would take undue experimentation to make the monoclonal antibodies required for the assay. The Federal Circuit reversed and held that the claims were enabled because the amount of experimentation required to isolate monoclonal antibodies and screen for those having the correct affinity was not undue. *See Id.* Clearly, the Federal Circuit

did not contemplate that every antibody useful in the methods of the claim must be identified. Rather, the court considered the amount of experimentation required to identify one or a few monoclonal antibodies having the required affinity. *See also, Johns Hopkins University v. Cellpro*, 931 F. Supp. 303, 324 (D. Del. 1996), *aff'd in part, vacated in part, and remanded*, 47 USPQ2d 1705 (Fed. Cir. 1998) (stating that "[t]he specification need only enable one mode of making the claimed invention.").

In the instant case, the quantity of experimentation required to practice the invention amounts to only a few steps: generating a nucleic acid molecule comprising a nucleotide sequence that encodes protein having an altered amino acid composition and determining whether that protein binds to at least one antibody or protein which binds to the corresponding native VSP α or VSP β protein. All of these steps are readily within the skill of those in the art and such assays, while routine in the art, have further been presented in the specification, particularly in working examples described on pages 14 and 19. Some of the claims (*e.g.*, claim 8 and claims dependent thereon) are drawn to plants containing nucleotide sequences encoding such proteins, and the additional steps required to practice these claims are also routinely performed by those of skill in the art.

Ample guidance is therefore provided to allow one of skill in the art to make and use the claimed invention. Consequently, contrary to the conclusions stated in the Office Action, the quantity of experimentation necessary and the amount of guidance presented in the specification is sufficient to enable the claimed nucleic acid molecules and plants. Accordingly, the rejection of the claims under 35 U.S.C. §112, first paragraph, should be withdrawn.

In view of the above arguments and amendments, all grounds for rejection under 35 U.S.C. § 112, first paragraph, have been overcome. Accordingly, it is respectfully submitted that the rejections under 35 U.S.C. § 112, first paragraph, should be withdrawn.

The Rejection of Claims Under 35 U.S.C. §112, Second Paragraph,
Should Be Withdrawn

The Office Action (4/8/04, page 5) has rejected claims 1-3, 5-12, and 14-20 under 35 U.S.C. §112, second paragraph, as being indefinite. Applicants respectfully traverse this rejection.

Claim 1 and other claims were rejected as being indefinite due to their recitation of “at least about”; the claims have been amended in order to clarify the lower limit of the claim. Similarly, claims 1 and 8 were rejected as indefinite for their recitation of “capable of binding,” and these claims have been amended as suggested to clarify that scope of the claims. Support for the amendments can be found throughout the specification, particularly for example on pages 2 and 7. Applicants note that one of skill in the art will appreciate that the claim does not require simultaneous binding by a particular antibody, monoclonal antibody, antibody fragment, or protein to both the native and engineered protein, as demonstrated, for instance, in the working example provided in the specification on page 21 (“Filter Lift Assay”).

Claims 1 and 8 were also rejected as indefinite for reciting a broad range or limitation together with a narrow range or limitation. Applicants note that these claims have been amended for clarification to remove the narrower range or limitation; accordingly, this ground for rejection has been obviated by amendment.

In view of the above amendments and comments, Applicants respectfully submit that the rejection of claims under 35 U.S.C. §112, second paragraph, should be withdrawn.

The Rejection of Claims Under 35 U.S.C. §102(e) Should Be Withdrawn

The Office Action (4/8/04, page 5) has maintained the rejection of claims under 35 U.S.C. §102 as anticipated by references previously cited against the claims in this case. Applicants are confused by this rejection because, as discussed in Applicants’ previous response, **the cited references do not teach all of the limitations of the claims and therefore cannot anticipate the claims under 35 U.S.C. §102.** Indeed, these rejections appear to have been repeated almost verbatim from the previously issued Office Action (dated 6/17/03) despite Applicants’ amendments and arguments of the previously filed response of August 14, 2003 (retransmitted to the PTO on December 18, 2003), which were apparently not considered.

The Office Action (page 6) has maintained the rejection of claims 1-3, 5-11, 14, and 17-18 under 35 U.S.C. §102(e) as being anticipated by Jung R. *et al.* Applicants again respectfully traverse this rejection. Independent claims 1 and 8 (and therefore claims 2-3 and 5-7 which are dependent on or incorporate the limitations of claim 1 and claims 9-12 and 14-20 which are

dependent on or incorporate the limitations of claim 8) **were previously amended** (in Applicants' response of August 14, 2003) **to include additional limitations**. Particularly, independent claims 1 and 8 now include the limitation that the native protein is VSP α or VSP β . **The Jung reference does not teach or suggest this limitation and therefore cannot anticipate the subject matter of the claims**. Accordingly, Applicants respectfully submit that the rejection of claims 1-3, 5-11, 14, and 17-18 under 35 U.S.C. §102(e) as being anticipated by Jung R. *et al.* should be withdrawn.

The Office Action (4/8/04, page 7) has maintained the rejection of claims 1-3, 5-12, 15-16, and 18-20 under 35 U.S.C. §102(e) as anticipated by Tarczynski *et al.* U.S. Pat. No. 6,080,913, filed September 25, 1996. Applicants respectfully traverse this rejection.

Independent claims 1 and 8 (and therefore claims 2-3 and 5-7 which are dependent on or incorporate the limitations of claim 1 and claims 9-12 and 14-20 which are dependent on or incorporate the limitations of claim 8) **were previously amended** (in Applicants' response of August 14, 2003) **to include additional limitations**. Particularly, independent claims 1 and 8 now include the limitation that the engineered protein retains the conformation of the native protein, which is VSP α or VSP β . **The Tarczynski reference does not teach or suggest this limitation and therefore cannot anticipate the subject matter of the claims**. Accordingly, Applicants respectfully submit that this rejection of the claims under 35 U.S.C. §102(e) should be withdrawn.

The Rejection of Claims Under 35 U.S.C. §103 Should Be Withdrawn

The Office Action (page 8) has maintained the rejection of claims 1-3, 5-11, and 14-20 under 35 U.S.C. §103(a) over the Jung reference in view of Gordon-Kamm *et al.* (1990) *The Plant Cell* 2: 603-608. As in the previous Office Action (6/17/03), the Office Action of 4/8/04 states that "[t]he claims are drawn to soybean and maize plants transformed with a nucleic acid molecule encoding a vegetative storage protein...."

Applicants again respectfully traverse this rejection. Applicants again note that **claims 1-4 are not drawn to transformed plants and therefore should apparently not have been included in this rejection**. In addition, the claims that are drawn to transformed plants are not

limited to maize and soybean, as stated in the Office Action. Applicants also reiterate that **the Jung reference has the same assignee as the present application and therefore the Jung reference is not available to be cited against the present application under 35 U.S.C. §103(c).**

To emphasize this point, which was noted in Applicants' previously filed response of August 14, 2003 (retransmitted to the PTO on December 18, 2003), Applicants reiterate that **the assignee on the Jung reference (i.e., Pioneer Hi-Bred International, Inc.) is the same assignee as the one on the present application.** Applicants are enclosing herewith a copy of the assignment filed in the parent case, Application No. 08/988,015, which shows that these applications are assigned to Pioneer Hi-Bred International, Inc. Applicants here quote 35 U.S.C. 103(c) in its entirety, with the particularly pertinent text highlighted for the Examiner's convenience:

Subject matter developed by another person, **which qualifies as prior art only under one or more of subsections (e), (f), and (g) of section 102 of this title, shall not preclude patentability** under this section where the subject matter and the claimed invention were, at the time the invention was made, owned by the same person or **subject to an obligation of assignment to the same person.**

(35 U.S.C. §103(c)). Because the assignee of the Jung reference and the assignee of the present application are the "same person," **the Jung reference is not available as a reference against the present claims under 35 U.S.C. §103(c).**

The only remaining reference cited against the claims is Gordon-Kamm *et al.* ((1990) *The Plant Cell* 2: 603-608). This reference is characterized in the Office Action as teaching "transformation of maize." Because the claims involve many more elements than the mere transformation of maize, none of which are taught by Gordon-Kamm *et al.*, the claims are not rendered obvious in view of this reference.

Although the Tarczyński reference was not cited against the claims under 35 U.S.C. §103(c), Applicants again note that the assignee on the Tarczyński reference (i.e., Pioneer Hi-Bred International, Inc.) is the same assignee as the one on the present application and therefore **the Tarczyński reference is not available as a reference against the present claims under 35 U.S.C. §103(c).**

In view of the above arguments, Applicants respectfully submit that the rejection of claims under 35 U.S.C. §103(a) should be withdrawn.

Consideration Of Previously Submitted Information Disclosure Statement

Applicants again note (as they did in the previous response of August 14, 2003 which was retransmitted to the PTO per the Examiner's request on December 18, 2003) that an initialed copy of the PTO Form 1449 that was submitted with Applicants' Information Disclosure Statement filed January 6, 2000, has not been returned to Applicants' representative with the Office Action. In addition, an initialed copy of the PTO Form 1449 that was submitted with Applicants' Information Disclosure Statement filed August 14, 2003, has not been returned to Applicants' representative with the Office Action. Accordingly, it is requested that an initialed copy of these Forms 1449 be forwarded to the undersigned with the next communication from the PTO. In order to facilitate review of the references by the Examiner, copies of the Information Disclosure Statements and the Forms 1449 are attached hereto. Copies of the cited references were provided at the time of filing the original Information Disclosure Statement, and, therefore, no additional copies of the references are submitted herewith. Applicants will be pleased to provide additional copies of the references upon the Examiner's request if it proves difficult to locate the original references.

CONCLUSION

In view of the above amendments and remarks, Applicants submit that the rejections of the claims under 35 U.S.C. §§112, 102, and 103 are overcome. Applicants respectfully submit that this application is now in condition for allowance. Early notice to this effect is solicited.

If in the opinion of the Examiner, a telephone conference would expedite the prosecution of the subject Application, the Examiner is invited to call the undersigned.

It is not believed that extensions of time or fees for net addition of claims are required, beyond those that may otherwise be provided for in documents accompanying this paper. However, in the event that additional extensions of time are necessary to allow consideration of this paper, such extensions are hereby petitioned under 37 CFR § 1.136(a), and any fee required

therefore (including fees for net addition of claims) is hereby authorized to be charged to Deposit Account No. 16-0605.

Respectfully submitted,



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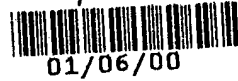
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Kindly acknowledge receipt of the accompanying DIVISIONAL PATENT
APPLICATION with Application Transmittal Cover Sheet for:

Inventor(s): Rao et al.

Title of Invention: COMPOSITIONS AND METHODS FOR ALTERING
AMINO ACID CONTENT OF PROTEINS

Pages of Spec. (including claims and abstract) 26; No. of Claims 20

No. of Drawing Sheets 8; Declaration Enclosed Yes - copy (4 pages)

Small Entity Statement Enclosed N/A;

IDS with PTO 1449 Enclosed yes-2 pages; (No. of 1449 Cites Enclosed 1)

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DOC DATE: 04/07/1998

ASSIGNOR:

SLEISTER, HEIDI MAJOR

DOC DATE: 04/07/1998

ASSIGNEE:

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PATENT NUMBER:

ISSUE DATE:

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DATE 7-1-98

ANTIONE ROYALL, EXAMINER
ASSIGNMENT DIVISION
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05-05-1998

ASSIGNMENT

R SHEET

Patents Only



100702171

 April 22, 1998
 Attorney Dkt:5718-16

To the Honorable Commissioner of Patents a

Please record the attached original documents or copy thereof.

1. Name of conveying party(ies):

A. Guraraj Rao and Heidi Major Sleister

APR 27 1998

Additional name(s) of conveying party(ies) attached? ___ Yes ☒ No

2. Name and address of receiving party(ies):

 Pioneer Hi-Bred International, Inc.
 800 Capital Square
 400 Locust Street
 Des Moines, Iowa 50309
Additional name(s) & address(es) attached? ___ Yes ☒ No

3. Nature of conveyance:

- ☒ Assignment
☐ Merger
☐ Security Agreement
☐ Change of Name
☐ Other _____

Execution Date: April 7, 19984. Application Serial No. 08/988,015

Patent No. _____

If this document is being filed together with a new application, the execution date of the application is: _____

Additional numbers attached? ___ Yes ☒ No

5. Name and address of party to whom correspondence concerning document should be mailed:

 W. Murray Spruill, Esq.
 BELL SELTZER INTELLECTUAL PROPERTY LAW GROUP
 ALSTON & BIRD LLP
 P. O. Drawer 34009
 Charlotte, NC 28234
6. Total number of applications and patents involved: 1
 7. Total fee (37 CFR 3.41) \$ 40.00
☒ Enclosed
☐ Authorized to be charged to deposit account

8. Deposit account number: 16-0605

DO NOT USE THIS SPACE

04/30/1998 CPATNE 00000059 08988015

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9. Statement and signature

To the best of my knowledge and belief, the foregoing information is true and correct and any attached copy is a true copy of the original document.

W. Murray Spruill, Esq. Reg. No. 32,943

Name of Person Signing

Signature

4/22/98

Date

Total number of pages including cover sheet, attachments and document: 4

ASSIGNMENT - WORLDWIDE

For good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, each undersigned inventor has sold and assigned, and by these presents hereby sells and assigns, unto

PIONEER HI-BRED INTERNATIONAL, INC.
800 Capital Square
400 Locust Street
Des Moines, Iowa 50309

its successors and assigns, the entire right, title and interest, so far as concerns the United States and the Territories and Possessions thereof and all foreign countries in and to the invention in **"COMPOSITIONS AND METHODS FOR ALTERING AMINO ACID CONTENT IN PROTEINS"**

as set forth in his United States Patent Application

- ☐ executed concurrently herewith
- ☒ executed on April 7, 1998
- ☒ Serial No. 08/988,015 filed December 10, 1997

said application for United States Letters Patent, including all divisional, renewal, substitute, continuation and Convention applications based in whole or in part upon said inventions or upon said applications, and any and all Letters Patent and reissues and extensions of Letters Patent granted for said inventions or upon said applications and every priority right that is or may be predicated upon or arise from said inventions, said applications, and said Letters Patent; said Assignee being hereby authorized to file patent applications in any or all countries on any or all said inventions in the name of the undersigned or in the name of said Assignee or otherwise as said Assignee may deem advisable, under the International Convention or otherwise; the Commissioner of Patents and Trademarks of the United States of America being hereby authorized to issue or transfer all said Letters Patent to said Assignee in accordance herewith; this assignment being under covenant, not only that full power to make the same is had by the undersigned, but also that such assigned right is not encumbered by any grant, license, or other right theretofore given, and that the undersigned will do all acts reasonably serving to ensure that the said inventions, patent applications and Letters Patent shall be held and enjoyed by said Assignee as fully and entirely as the same could have been held and enjoyed by the undersigned if this assignment had not been made, and particularly to execute and deliver to said Assignee all lawful documents including petitions, specifications, oaths, assignments, invention disclaimers, and lawful affidavits in form and substance which may be requested by said Assignee, to furnish said Assignee with all facts relating to said inventions or the history thereof and any and all documents, photographs, models, samples or other physical exhibits which may be of said inventions, and to testify in any proceedings relating to said inventions, patent applications, Letters Patent.

IN WITNESS WHEREOF, I have hereunto set my hand and seal on this 7 day
of April, 1998.

Heidi Major Sleister (SEAL)
Heidi Major Sleister

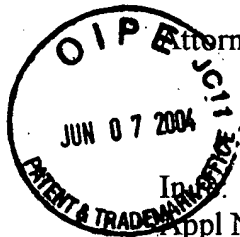
STATE OF IOWA)
COUNTY OF Polk) ss:
)

Before me personally appeared Heidi Major Sleister, to me known to be the person
described in and who executed the foregoing instrument, and she acknowledged to me that
she executed the same for the purpose therein stated, this 7 day of April,
1998.

Sharon Butler
Notary Public

SEAL

My Commission Expires: 7-19-98



Attorney's Docket No. 5716-16B

PATENT
COPY

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor: Rao et al.
Appl No.: To be assigned
Filed: Concurrently Herewith
For: Group Art Unit: To be assigned
Examiner: To be assigned
COMPOSITIONS AND METHODS FOR ALTERING
AMINO ACID CONTENT OF PROTEINS

January 6, 2000

Assistant Commissioner for Patents
Washington, DC 20231

**INFORMATION DISCLOSURE STATEMENT
CITATION UNDER 37 C.F.R. § 1.97**

Sir:

Attached is a list of documents on form PTO-1449. It is requested that the Examiner consider these documents and officially make them of record in accordance with the provisions of 37 C.F.R. § 1.97 and Section 609 of the MPEP. By submitting the listed documents, Applicant in no way makes any admission as to the prior art status of the listed documents, but is instead submitting the listed documents for the sake of full disclosure.

All items are attached except those that were supplied in parent Application No. 08/988,015 filed 12/10/1997. Since the benefit of this application was claimed under 35 U.S.C. 120, no copies need to be furnished in accordance with 37 C.F.R. 1.98(d); however, copies will be furnished on request.

Respectfully submitted,

W. Murray Spruill
Registration No. 32,943

ALSTON & BIRD LLP
Post Office Drawer 34009
Charlotte, NC 28234
Tel Raleigh Office (919) 420-2200
Fax Raleigh Office (919) 420-2260

"Express Mail" Mailing Label Number EL039496705US
Date of Deposit: January 6, 2000

I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to Box Patent Application, Assistant Commissioner of Patents, Washington, DC 20231.

Sheree T. Edington

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

Sheet	1	of	2
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Application Number	To be assigned
Filing Date	Concurrently Herewith
First Named Inventor	Rao et al.
Group Art Unit	To be assigned
Examiner Name	To be assigned
Attorney Docket Number	5718-16B

[illegible]

FOREIGN PATENT DOCUMENTS								
Examiner Initials	Cite No.	Foreign Patent Document			Name of Patentee or Applicant of Cited Document	Date of Publication of Cited Document MM-DD-YYYY	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T
		Office	Number	Kind Code (if known)				
	3	WO	93/08682		State University of New Jersey - Rutgers	05/13/1993		
	4	WO	94/16088		Rijksuni-Versiteit Leiden	07/21/994		
	5	WO	95/22625		Affymax Technologies	08/24/1995		
	6	WO	95/31554		E.I. DuPont De Nemours and Company	11/23/1995		
	7	WO	96/38563		Pioneer Hi-Bred International, Inc.	12/05/1996		
	8	WO	97/35023		Pioneer Hi-Bred International, Inc.	09/25/1997		
	9	WO	97/20078		Affymax Technologies	06/05/1997		

Date
Considered

***Examiner: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.**

Substitute for form 1449A/PTO

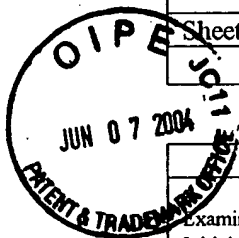
**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**

(Use as many sheets as necessary)

Sheet 2 of 2

Complete 1: Known

Application Number	To be assigned
Filing Date	Concurrently Herewith
First Named Inventor	Rao et al.
Group Art Unit	To be assigned
Examiner Name	To be assigned
Attorney Docket Number	5718-16B

**NON PATENT LITERATURE DOCUMENTS**

Examiner Initials	Cite No.	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T
	10	ALTENBACH et al., Enhancement of the Methionine Content of Seed Proteins by the Expression of a Chimeric Gene Encoding a Methionine-Rich Protein in Transgenic Plants, Plant Molecular Biology, 1989, pages 513-522, vol. 13, Belgium	
	11	SCOTT et al., Searching for Peptide Ligands with an Epitope Library, Science, 1990, pp. 386-390, vol. 249	
	12	STASWICK, P., Novel Regulation of Vegetative Storage Protein Genes, The Plant Cell, January 1990, pages 1-6, vol. 2,	
	13	STEMMER, W., Rapid Evolution of a Protein <i>In Vitro</i> By DNA Shuffling, Nature, Aug. 4, 1994, pages 389-391, vol. 374	
	14	STEMMER, W., DNA Shuffling by Random Fragmentation and Reassembly: <i>In Vitro</i> Recombination for Molecular Evolution, Proc. Natl. Acad. Sci. USA, Oct. 1994, ppages 10747-10751, vol. 91	
	15	HONGDI et al., A Phage Display System for Studying the Sequence Determinations of Protein Folding, Protein Science, 1995, pp. 1108-1117, vol. 4	
	16	MARCELLINO et al., Modified 2S Albumins with Improved Tryptophan Content are Correctly Expressed in Transgenic Tobacco Plants, FEBS Letters, 1996, pages 154-158, vol. 385	
	17	MOLVIG et al., Enhanced Methionine Levels and Increased nutritive Value of Seeds of Transgenic Lupins (<i>Lupinus Angustifolius L.</i>) Expressing a Sunflower Seed Albumin Gene, Proc. Natl. Acad. Sci. USA, Aug. 1997, pages 8393-8398, Vol. 94, Agricultural Sciences	
	18	FRIGUET et al., Immunochemical Analysis of Protein Conformation, Protein Structure a Practical Approach, pp. 287-310, IRL Press, Oxford University Press, MRC Laboratory of Molecular Biology, Hills Road, Cambridge CB2 2QH, UK	

RTA01/2072075v1

Examiner Signature		Date Considered	
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*Examiner: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.



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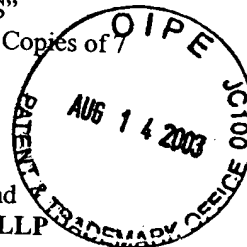
Commissioner For Patents
Alexandria, VA 22313

Date Mailed: August 12, 2003
Atty. Dkt. No. 035718/193735

Application No. 09/478,567; Filing Date: January 6, 2000
Inventor(s): Rao *et al.*; Title of Invention: "COMPOSITIONS AND METHODS
FOR ALTERING AMINO ACID CONTENT OF PROTEINS"
Documents Enclosed: IDS (1 page); Form 1449 (1 page); and Copies of 7
References

Check Enclosed: \$0

Kindly acknowledge receipt by placing office stamp hereon and
returning postcard to: Lynda-Jo Pixley - ALSTON & BIRD LLP



Attorney's Docket No. 035718/193735

PATENT

COPY

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re: Rao *et al.* Confirmation No.: 1859
Appl. No.: 09/478,567 Art Unit: 1638
Filed: January 6, 2000 Examiner: Russell Kallis
For: COMPOSITIONS AND METHODS FOR ALTERING AMINO ACID
CONTENT OF PROTEINS

August 12, 2003



Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

**INFORMATION DISCLOSURE STATEMENT
CITATION UNDER 37 C.F.R. § 1.97**

Sir:

It is requested that the Examiner consider these documents and officially make them of record in accordance with the provisions of 37 C.F.R. § 1.97 and Section 609 of the MPEP. By submitting the listed documents, Applicant in no way makes any admission as to the prior art status of the listed documents, but is instead submitting the listed documents for the sake of full disclosure.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Leigh W. Thorne".

Leigh W. Thorne
Registration No. 47,992

Customer No. 29122
ALSTON & BIRD LLP
Bank of America Plaza
101 South Tryon Street, Suite 4000
Charlotte, NC 28280-4000
Tel Raleigh Office (919) 862-2200
Fax Raleigh Office (919) 862-2260

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to:
Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on August 12, 2003

A handwritten signature in black ink, appearing to read "Lynda-Jo Pixley".
Lynda-Jo Pixley

Substitute for form 1449/PTO
(Revised 04/2003)

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 1 of 1

Complete if Known

Application Number	09/478,567
Filing Date	January 6, 2000
First Named Inventor	Rao
Group Art Unit	1638
Examiner Name	Russell Kallis
Attorney Docket Number	035718/193735

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.	Document Number Number - Kind Code (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages of Relevant Figures Appear
	1	US-5,288,629	02-22-1994	Berkner	
	2	US-5,559,223	09-24-1996	Falco <i>et al.</i>	

FOREIGN PATENT DOCUMENTS

Examiner Initials	Cite No.	Foreign Patent Document Country Code - Number Kind Code (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	English Language Translation Attached

OTHER DOCUMENTS

Examiner Initials	Cite No.	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	English Language Translation Attached
	3	ARNOLD, F.H., <i>et al.</i> , "Optimizing Industrial Enzymes by Directed Evolution," <i>Adv. Biochem. Eng. Biotechnol.</i> , 1997, pp. 1-14, Vol. 58.	
	4	DYER, J.M., <i>et al.</i> , "Extensive Modifications for Methionine Enhancement in the beta-Barrels Do Not Alter the Structural Stability of the Bean Seed Storage Protein Phaseolin," <i>J. Protein Chemistry</i> , 1995, pp. 665-678, Vol. 14(8).	
	5	GOLDBERG, M.E., "Investigating Protein Conformation, Dynamics and Folding with Monoclonal Antibodies," <i>TIBS</i> , 1991, pp. 358-362, Vol. 16(10).	
	6	JAYNES, J.M., "De Novo Designed Synthetic Plant Storage Proteins: Enhancing Protein Quality of Plants for Improved Human and Animal Nutrition," <i>Proceedings of Alltech's 10th Annual Symposium</i> , Lexington, KY, May 1994, pp. 129-153.	
	7	LOPES, M.A., "Approaches for Enhancing the Lysine Content of Maize Seed," <i>Biotechnol. Nutr. Proc. Int. Symp. 3rd</i> , 1992, pp. 237-252.	

Examiner Signature		Date Considered	
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*Examiner: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.